



## Emerging Lighting Technology

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- Purpose: demonstrate new SSL products in real-world applications that save energy, match or improve illumination, and are cost-effective
- Demos generate critical field experience providing:
  - Feedback to manufacturers
  - Data for utility incentives
  - Market readiness of specific applications to users
  - Advancement in lighting knowledge



Central Park, NY

Photo: Ryan Pyle



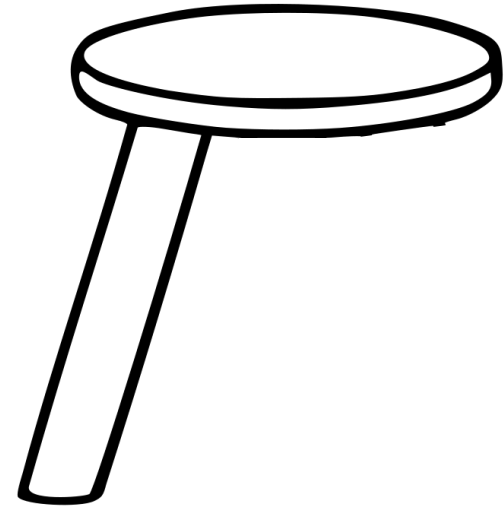
Smithsonian American Art Museum, Washington, D.C. Photo: Scott Rosenfeld

# LED Product Explosion



# LEDs are Not a Universal Lighting Solution Yet

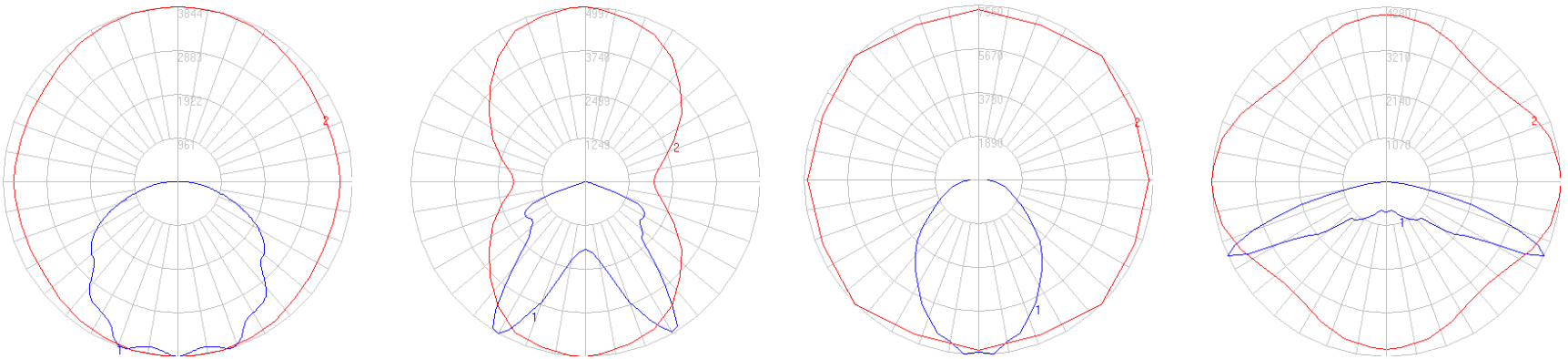
- Energy savings is “easy”
- Illumination quality is not easy
- Cost effectiveness is not easy



- Traditional light sources have been around for decades
- Systems and installations have been designed around them; value-engineering is complete
- LED technology still evolving at rapid pace

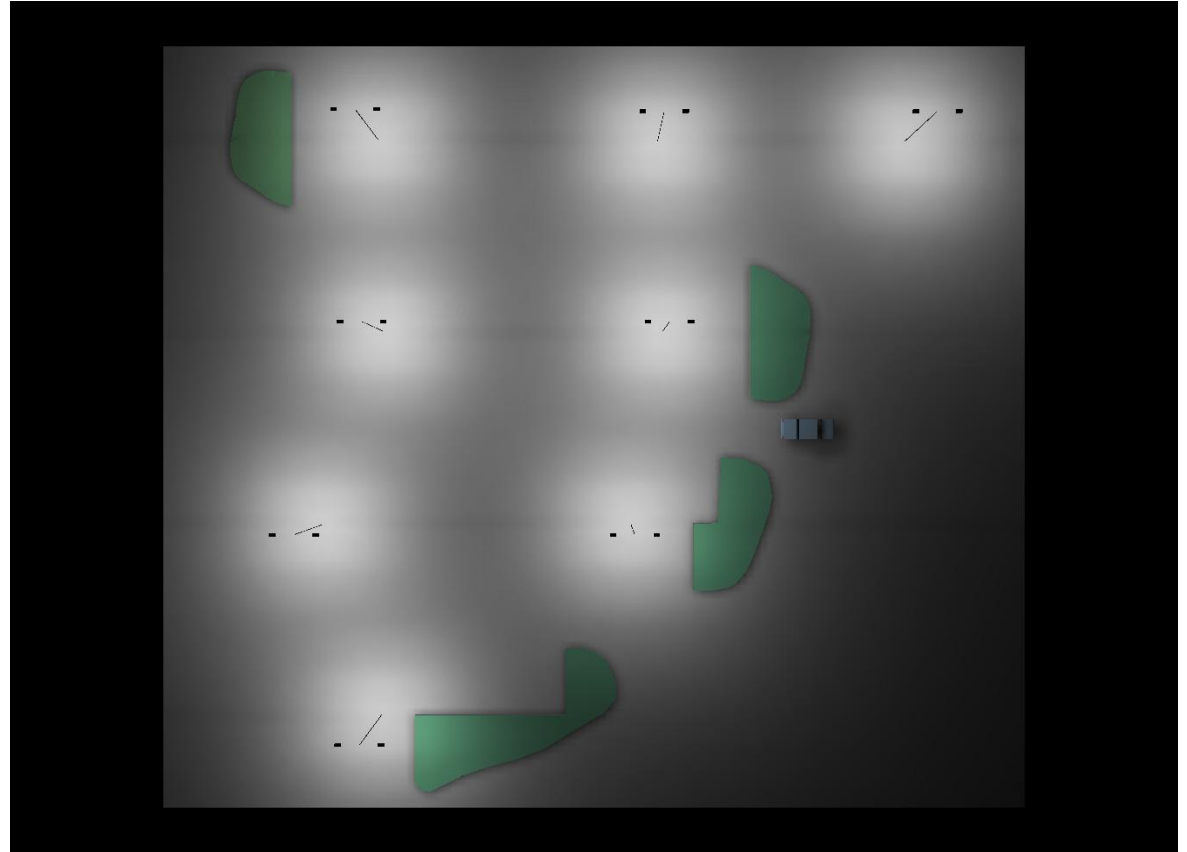
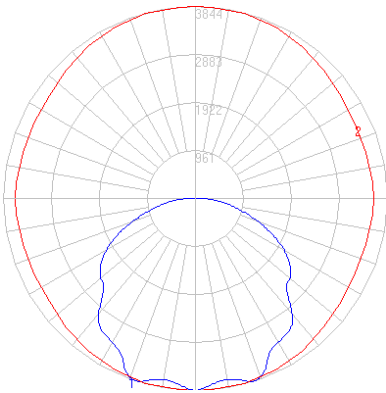
# Illumination Quality – Distribution Matters!

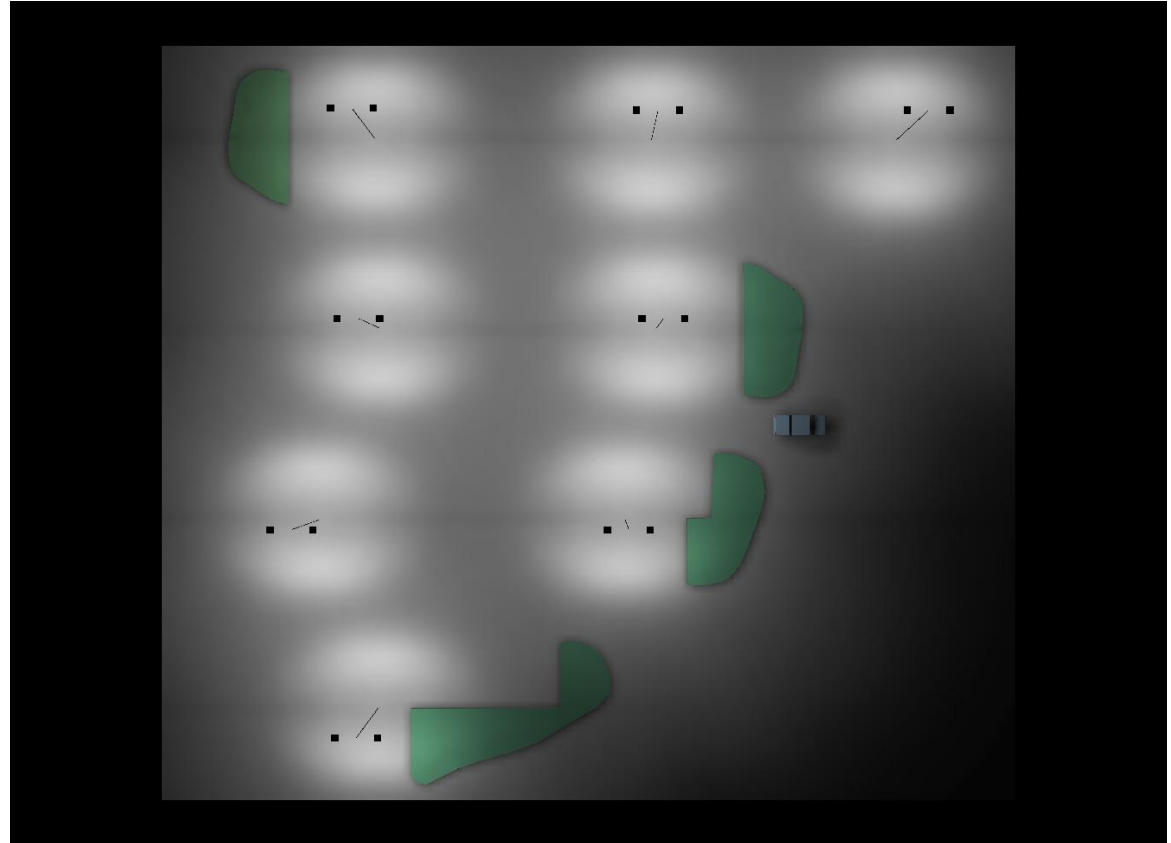
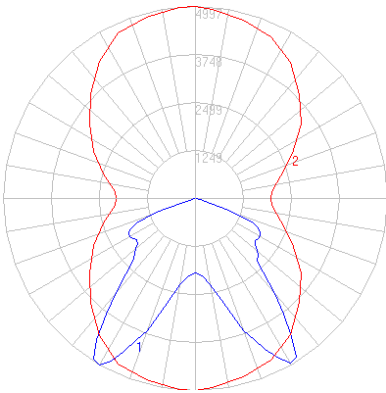
Four different parking lot products:



All roughly the same lumen output, but distributions are quite different.

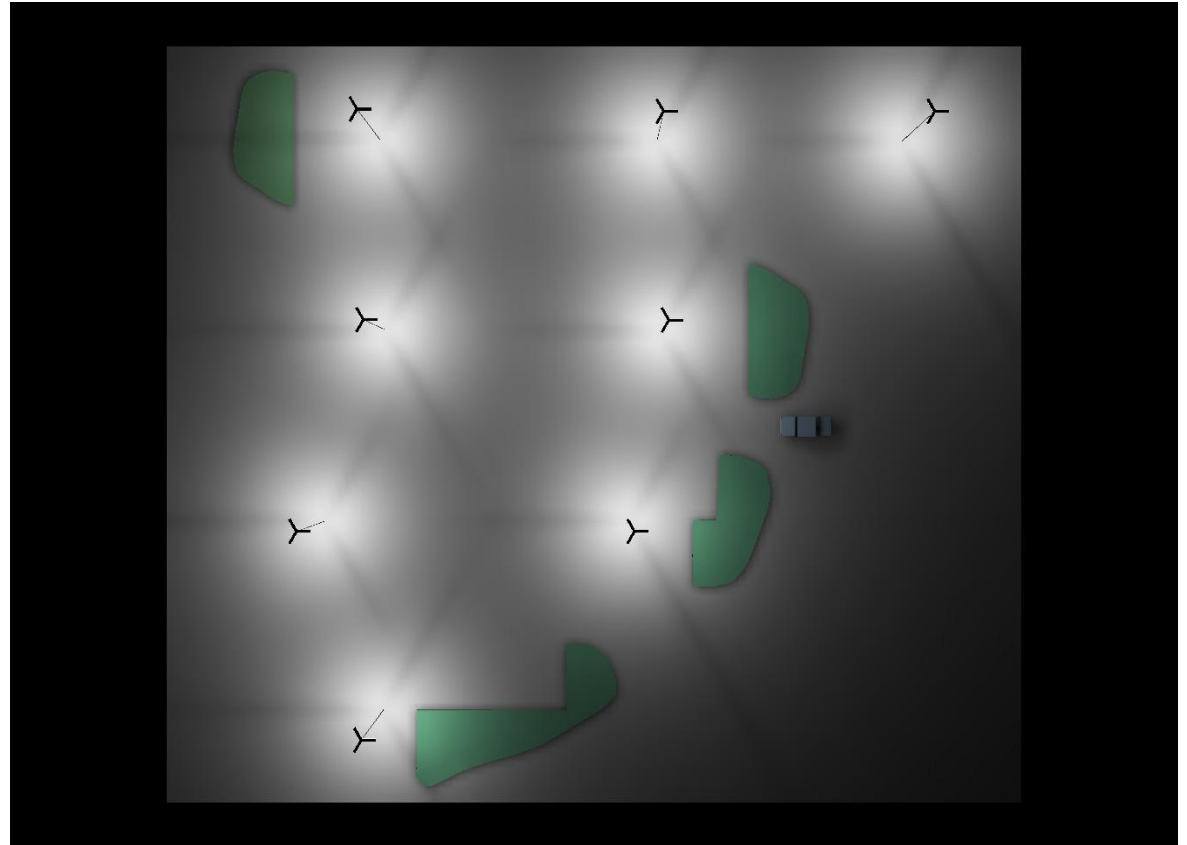
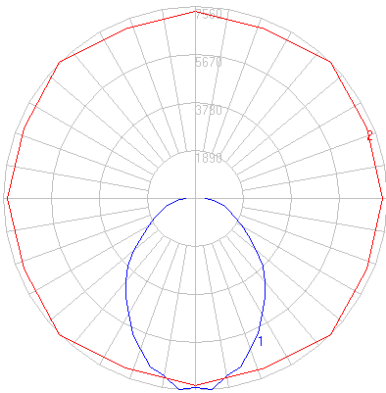
# Distribution 1





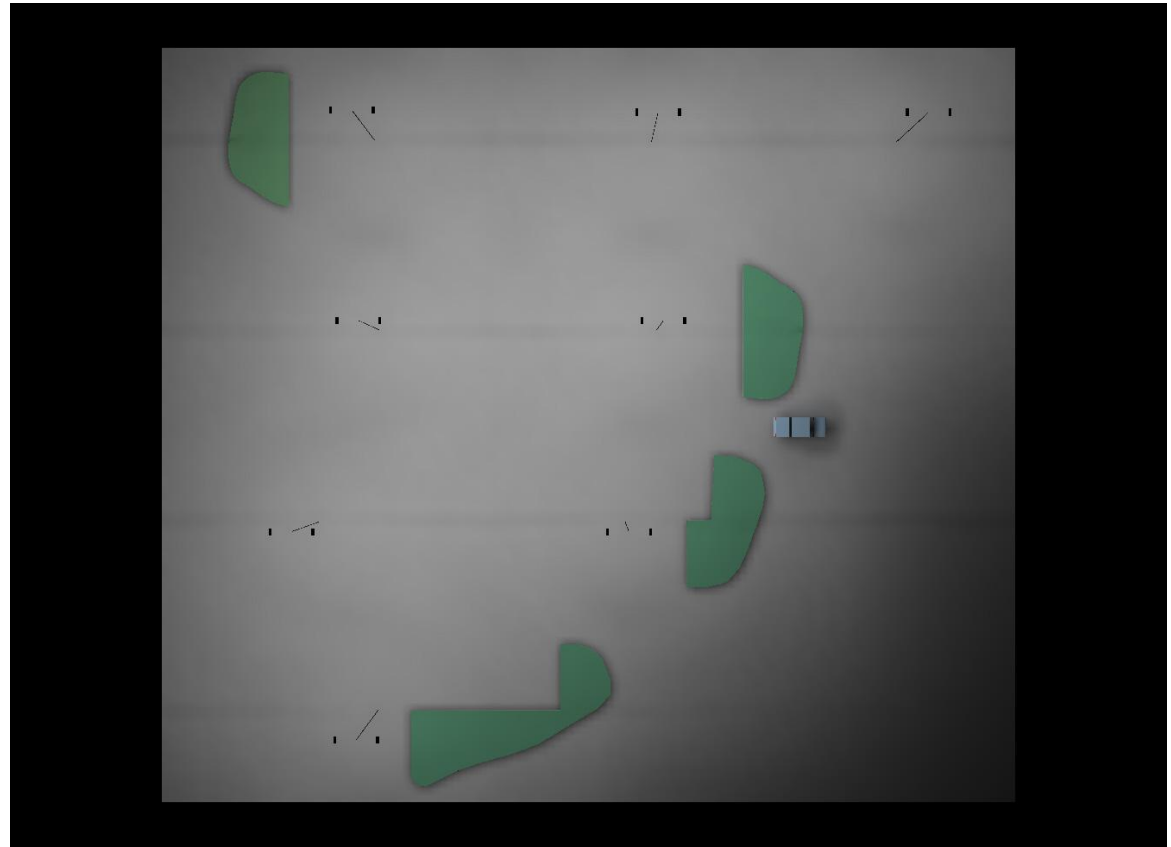
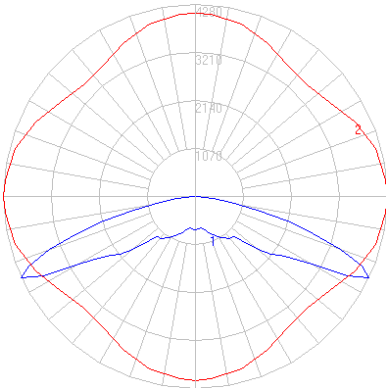


# Distribution 3





# Distribution 4



# Manufacturer Claims Not Always Accurate

CALiPER SSL Sample	Manufacturer Claims	CALiPER Measured	Accurate ?
MR16, 4W	130 lm, 37 lm/W <i>"Replaces 20W halogen MR16 bulb"</i>	129 lm, 37 lm/W 618 cd, 21° <b>Less than average 20W halogen</b>	YES NO
PAR30, 10W	418 lm, 38 lm/W <i>"Replaces 50W halogen PAR30"</i>	457 lm, 47 lm/W 2407 cd, 20° <b>Meets average 50W halogen</b>	YES
PAR38, 16W	600 lm, 35 lm/W <i>"Replaces 45W halogen PAR38"</i>	635 lm, 41 lm/W 3257 cd, 20° <b>Exceeds average 45W halogen</b>	YES
A19, 6W	336 lm, 60 lm/W	389 lm, 67 lm/W <b>Meets average 40W Incandescent</b>	YES

Source: DOE CALiPER Testing Program

- Integral occupancy sensor dims fixture to 10% power
- 55% installed wattage reduction in high state; 95% reduction in low
- ~80% kWh energy savings expected, incl. dimming
- Initial minimum horizontal illuminance increased 21%; average decreased 53%
- ~8 year simple payback (for retrofit), ~5 year for new
- 1:1 replacement

**Before (HPS)**

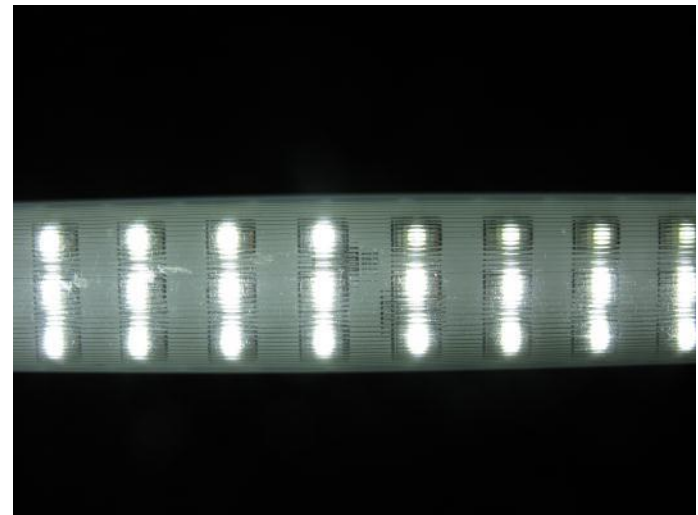


**After (LED & Sensor)**



# Less Successful Application – LED T-8 Replacement Products

- GATEWAY completing a laboratory-based comparison of T-8 replacement products
- Selected the best three performers identified in CALiPER testing
- Comparisons involve performance in prismatic, parabolic and basket troffers in both 2- and 3-lamp configurations
- FL benchmark lamps include “standard” T-8 (735) and a high efficiency (hi-lumen) T-8; a T-12 was also included for comparison
- Measurements performed at Lighting Design Lab in Seattle
- GATEWAY final report under preparation



# Less Successful Application – LED T-8 Replacement Products cont'd

## Example Results

(Prismatic 2-Lamp Troffer):

Power draw / factor

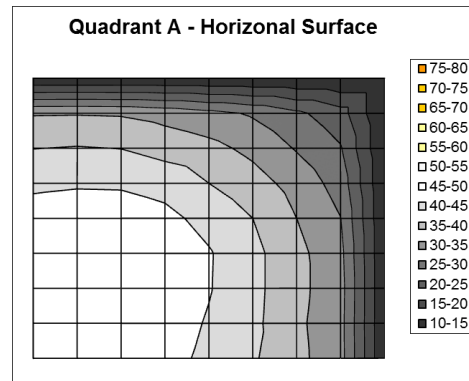
**735 Fluorescent**

57W / .98 pf

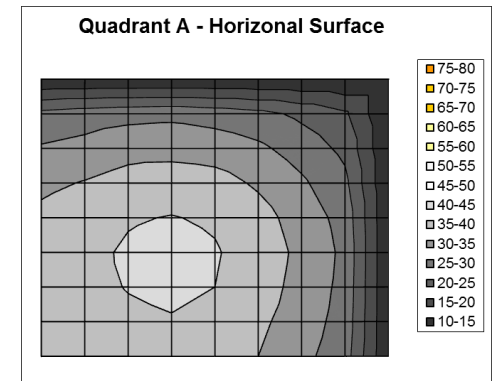
**“Best” LED Measured**

37W / .78 pf

Illuminance on work plane



Max: 49.3 fc  
Ave: 40.2 fc  
Min: 22.1 fc



Max: 41.4 fc  
Ave: 34.1 fc  
Min: 20.8 fc

Price paid per lamp in  
this study

\$2

~\$90 (avg of all  
three products)

## Financial Incentives for Lighting Power Densities

- Sliding scale reductions for income taxes
- \$0.30 / sf when lighting is 0.225 W/sf
- \$0.60 / sf when lighting is 0.18 W/sf
- Applicable to covered floors
  - Open-to-sky top floors not applicable
- Extended from expiring in 2009 to December 31, 2013
- IRS Notice 2008-40 issued March 7, 2008
- Gov't Structures \$\$ → Design Team



## Parking Structures → Low-hanging fruit

- Large footprint, but low equipment density
  - High income tax rebate with low-capital outlay

**DOE Solid-State Lighting Website:** [www.ssl.doe.gov](http://www.ssl.doe.gov)

**CALiPER Program:**

<http://www1.eere.energy.gov/buildings/ssl/caliper.html>

**GATEWAY Program:**

<http://www1.eere.energy.gov/buildings/ssl/gatewaydemos.html>

**Municipal Solid-State Street Lighting Consortium:**

<http://www1.eere.energy.gov/buildings/ssl/consortium.html>

**Technology Fact Sheets:**

<http://www1.eere.energy.gov/buildings/ssl/factsheets.html>

**Commercial Building Energy Alliances Performance Specs:**

<http://www1.eere.energy.gov/buildings/alliances/technologies.html>





I-35W  
Bridge,  
Minneapolis

Photo:  
BetaLED

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